Department of Energy
Washington, DC 20585
October 19, 1999

MEMORANDUM FOR: Assistant Secretary for Defense Programs
Assistant Secretary for Environmental Management
Assistant Secretary for Fossil Energy
Director, Office of Nuclear Energy, Science and Technology Director, Office of Civilian Radioactive Waste Management Director, Office of Science

FROM: Dan Reicher (original signed by Dan Reicher)
Assistant Secretary
Energy Efficiency and Renewable Energy

SUBJECT: Distribution of Reporting Guidance for Implementing the Secretary's Phaseout Goal for Select DOE Air-Conditioning and Refrigeration Chillers

On August 26, 1999, Deputy Secretary T. J. Glauthier approved the issuance of the subject reporting guidance for distribution to all field elements. This reporting guidance (Attachments 1 and 2 referenced below) will help implement Secretary Richardson's December 10, 1998, memorandum, "Phaseout Goal for DOE's Air-conditioning and Refrigeration Chillers to Protect the Ozone Layer and to Reduce Energy Costs."

As part of this reporting guidance included in Attachment 1, each DOE facility is required to submit a Phaseout Plan through the appropriate Field Office to the Lead Program Secretarial Officer (LPSO) at Headquarters by April 1, 2000. In addition to the Phaseout Plan, each DOE site is required to submit a Progress Report through the appropriate Field Office to its LPSO by December 1 of each year from 2001-2005. Attachment 2 is guidance that has been jointly prepared by my Office and the Office of Environment, Safety and Health for assisting the DOE sites with meeting the Secretary's goal.

The reporting requirements and guidance should be sent to the Field Offices for which you are the LPSO. Attachment 3 is a sample transmittal memorandum you may wish to use to send these documents.

If you have any questions concerning this action, please contact Victor Petrolati of the Office of Federal Energy Management Programs on 202-586 4549 (e-mail: victor.petrolati@ee.doe.gov).

Attachments

cc:
T.J. Glauthier, DS
Ernest J. Moniz, US
Robert W. DeGrasse Jr., WT-1
Richard Farrell, MA-1
David M. Michaels, EH-1

Attachment 1

Reporting on Progress to Meet the Secretary's Chiller Phaseout Goal

Secretary Richardson's December 10, 1998, memorandum, "Phaseout Goal for DOE's Air-conditioning and Refrigeration Chillers to Protect the Ozone Layer and to Reduce Energy Costs" requested that DOE elements report on progress towards achieving the goal of retrofitting or replacing by 2005 all DOE chillers using class I refrigerants that are greater than 150 tons of cooling capacity and were manufactured prior to 1984. The Environmental Executive (Dan Reicher, EE-1) was given the responsibility to consolidate information and report on the Department's progress towards achieving the goal.

1. To respond to the Secretary's request, each DOE facility is asked to submit a phaseout plan through the appropriate DOE Field Office to the Lead Program Secretarial Officer (LPSO) at Headquarters by April 1, 2000. The phaseout plan will consist of the following information:

(a) An inventory of all DOE chillers using class I refrigerants that are greater than 150 tons of cooling capacity and were manufactured prior to 1984. In addition, please provide the following equipment information in the phaseout plan through data entered into the Facility Information Management System (FIMS)[1] for these chillers: DOE facility name; chiller ID number; manufacturer; manufacturer model, serial numbers; installation date; area served by chiller; building(s) served by FIMS ID number; nameplate capacity (tons); efficiency (kw/ton); annual hours of operation; identity of refrigerant; and total charge of refrigerant (lb.);

(b) A current evaluation of the projected funding mechanism (e.g., energy savings performance contracts, appropriated funding, etc.) to achieve the Secretary's goal for each of the chillers identified in (a), above;

(c) A current evaluation of the projected schedule for achieving the Secretary's goal for the chillers identified in (a) for each DOE facility, including the number to be replaced or retrofitted in FY 2000, and the projected number to be replaced or retrofitted in each subsequent year;

(d) The expected number of exemptions to be requested, and the identity of each expected exempted chiller. Also, for each exemption approved by the PSO before April 1, 2000, the identity of the exempted chiller, and a summary of why the exemption was granted;

(e) Any anticipated problems in attaining the Secretary's goal; and

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[1]FIMS is a DOE-wide computerized data base developed to provide a real property inventory system. Further information on this system can be obtained from Mr. Kenneth Baker of the Office of the Office of Field Integration (202-586-4502).

Each LPSO is asked to forward an electronic version or hard copies of this information by April 30, 2000 to:

Victor Petrolati
EE-90
Forrestal Building
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585-0121
e-mail: victor.petrolati@hq.doe.gov

2. In addition to the phaseout plan, each DOE facility is asked to submit a progress report through the appropriate DOE Field Office to its LPSO by December 1 of each year from 2001-2005, that will consist of the following information: A three-page or less status summary on progress made in achieving the Secretary's goal. In addition to a general discussion on progress made, the report should include: the number of >150 ton chillers replaced and retrofitted since the last report; any changes in the projected schedule for attaining the Secretary's goal since the last report; any changes in the projected funding mechanism since the last report; and any new problems arising that might jeopardize meeting the goal. Also, the report should identify chiller exemptions approved since the last report, and summarize the reasons why the exemptions were granted.

Each LPSO is also asked to forward the progress reports to Mr. Petrolati by January 3 of each year.[2]

[2]As a supplement to this reporting request, the Office of Environmental Policy and Assistance (EH-41) would also like to solicit the voluntary submission of information from DOE facilities on exemplary practices and successful phaseout projects for all ozone-depleting substances (ODS) for posting on EH-41's Web Site. The dissemination of successful ODS phaseout information will promote their consideration and possible adoption by other DOE facilities. Staff who have write-ups on these practices and projects should get in touch with Ted Koss of EH-41 (e-mail: theodore.koss@eh.doe.gov; phone: 202-586-7964). Information on successful DOE ODS phaseout projects can be accessed from EH-41's ODS Web Site at: http://www.eh.doe.gov/oepa/ods/. At this location click "Successful ODS Phaseouts at DOE Facilities".

ATTACHMENT 2
8/17/99

Guidance for the Implementation of the Secretarial Memorandum on Replacement or Conversion of Selected DOE Chillers Using Class I Refrigerants

August 1999

Prepared by
the U.S. Department of Energy
Office of Environmental Policy and Assistance (EH-41)
Office of Federal Energy Management Programs (EE-90)

Acronyms and Abbreviations

BOA	Basic Ordering Agreements
CAA	Clean Air Act
CFCs	Chlorofluorocarbons
DLA	Defense Logistics Agency
DOE	Department of Energy
EADS	Energy Assest Disposal System
EE	Office of Energy Efficiency and Renewable Energy
EH	Office of Environment, Safety and Health
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESCO	Energy Service Company
ESPC(s)	Energy Savings Performance Contracts
FEMP	Office of Federal Energy Management Programs
FPMR	Federal Property Management Regulations
FSC	Federal Supply Classification Codes
FSM	FEMP Service Network
GSA	General Services Administration
HCFCs	Hydrochlorofluorocarbons
LCC	Life Cycle Cost
MA	Office of Contract and Management
O&M	Operation and Maintenance
PNNL	Pacific Northwest National Laboratory

RO	Regional Offices
WT-1	Director, Office of Worker and Community Transition

CONTENTS

1.0 INTRODUCTION

On December 10, 1998, Secretary Richardson signed a memorandum establishing a Departmental goal to retrofit or replace by the year 2005 all Department of Energy (DOE) chillers using class I ozone-depleting refrigerants[1] that are greater than 150 tons of cooling capacity and were manufactured prior to 1984. Appendix A is a copy of this memorandum[2]. Studies carried out by staff from the Office of Energy Efficiency and Renewable Energy (EE) and from the Office of Environment, Safety and Health (EH) have indicated that this memorandum will accomplish the following:

- Reduce DOE class I ozone-depleting substance emissions, and reduce in-chiller use of these substances up to one-half (by nearly 300,000 lb.), in order to make progress in meeting Clean Air Act and Executive Order (E.O.) 12843 (*"Procurement Requirements and Policies for Federal Agencies for Ozone-Depleting Substances"*) requirements to protect the stratospheric ozone layer. These requirements direct Federal agencies to significantly decrease use, where practicable, of ozone-depleting substances through the substitution of safe alternative substances and through cost-effective procurement practices.

- Implement the President's July 25, 1998, memorandum, *"Cutting Greenhouse Gases Through Energy Savings Performance Contracts"*, that directs all Cabinet agencies to expand the use of Energy Savings Performance Contracts (ESPCs). ESPCs leverage private sector investment and expertise to accomplish energy and cost-saving projects in Federal facilities at no additional cost to taxpayers. EE/EH studies indicate that approximately 50 percent of the above-mentioned category of chillers can be replaced using ESPCs.

- Help achieve DOE energy conservation goals to reduce energy consumption by 30 percent by the year 2005, as required by E.O. 13123, "*Greening the Government Through Efficient Energy Management*". The Secretary's memorandum will also complement the 1992 Energy Policy Act goal for the Department to accomplish, where practicable, all energy and water conservation measures with less than a ten-year payback by January 1, 2005.

- Result in less fossil fuel burned by electric utility power plants serving DOE because of the energy savings associated with the installation of new, markedly more energy-efficient chillers. We estimate that this initiative will reduce power plant air pollutant emissions by over 100,000 tons/yr. of carbon dioxide, over 400 tons/yr. of nitrogen oxides, and 1000 tons/yr. of sulfur

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[1] Class I ozone-depleting refigerants are those refrigerants that cause or contribute significantly to harmful effects to the stratospheric ozone layer, including all refrigerants that have an ozone depletion potential of 0.2 or greater. Class I refrigerants in use at DOE facilities are as follows: Chlorofluorocarbon (CFC)-11, CFC-12, CFC-13, CFC-113, CFC-13b1, CFC-114, CFC-115, CFC-500, CFC-502 and CFC-503.

[2] An electronic version of this memorandum can also be accessed from the Office of Environmental Policy and Assistance (EH-41) ozone-depleting substances web site at: http://www.eh.doe.gov/oepa/guidance/ozone/; at this site click on "OEPA Guidance/Correspondence on ODSs".

dioxide.[3] These pollutants are responsible for global warming and acid rain; also, in some areas emissions of nitrogen oxides and sulfur dioxide can threaten attainment of the National Ambient Air Quality Standards.

Section 2.1 of this guidance discusses refrigerant management planning in the context of the Secretary's December 1998 memorandum, and the general, long-term phaseout of refrigeration and air conditioning equipment using ozone-depleting refrigerants. Section 2.2 addresses energy management planning and programs, including alternative financing strategies for funding chiller replacements and retrofits. Section 2.3 identifies DOE Headquarters and DOE facility points of contact for issues associated with the guidance. Section 2.4 establishes criteria that will allow affected organizations to exempt particular chillers from the Secretary's goal.

[3]Based on projected chiller replacements, and pollutant emission factors from the 1997 National Institute of Standards and Technology BLCC program.

2.0 IMPLEMENTATION GUIDANCE

2.1 Refrigerant Management Planning

Environmental regulations and requirements, the production phaseout of ozone-depleting refrigerants, and DOE's guidance and policy on the eventual discontinuation of the use of ozone-depleting substances have a substantial effect on the management of refrigerants for refrigeration and air conditioning applications at DOE facilities. Many DOE facilities have identified and prioritized their current applications and are developing or implementing plans to replace or convert refrigeration equipment. In August of 1994, the Office of Environment, Safety and Health (EH) distributed a guidance document entitled, *"Recommended Approaches to Management of Refrigerants at Department of Energy Facilities,"*[4] which was prepared to assist DOE and DOE contractor personnel in identifying and implementing both near-term actions and long-range strategies for refrigerant fluorocarbon management and phaseout. The 1994 guidance was developed to be sufficiently flexible to allow DOE managers to develop refrigerant management plans tailored to their individual needs, while fostering general consistency of these plans on a Department-wide basis. Much of the material presented in Section 2.1 is extracted from the 1994 guidance, with additional, updated information also provided. The refrigerant management planning concepts discussed in Section 2.1 apply not only to the greater-than-150-ton-capacity chillers using class I refrigerants built before 1984, but also to all other chillers using class I substances.

2.1.1 Framework for Chiller Refrigerant Management

Refrigeration equipment manufacturers, and operations and maintenance personnel often consider equipment age when making retrofit or replacement decisions. However, a properly applied life-cycle costing approach will take into account details beyond equipment age, such as return on investment from savings achieved through improvements in energy efficiency, and operations and maintenance, that should be considered in prioritizing equipment for phaseout.

It should be recognized that no single criterion is all-encompassing for determining whether equipment should be replaced or retrofitted. The remaining useful life of equipment, the operational environment, and sound engineering judgement and experience must be included in any analysis. Energy efficiency, replacement and operational costs, type of application, capacity, facility mission and location, facility closure plans (where applicable), available sources of refrigerant and alternatives, and other factors will also affect equipment management decisions. A more detailed discussion on factors to be considered in deciding whether to replace or retrofit chillers subject to the Secretary's December 1998 memorandum, and other chillers using class I refrigerants, is presented in Section 2.1.2.

The Secretary's memorandum requests that DOE facilities plan for the eventual phaseout of all remaining refrigeration and air conditioning equipment that uses class I refrigerants. We recommend that this planning also address the management of refrigerant to provide for an orderly and cost-effective

[4]This 1994 guidance document is available from the Office of Environmental Policy and Assistance (EH-41) Web Site: http://www.eh.doe.gov/oepa/guidance/ozone/; at this site click on "OEPA Guidance/Correspondence on ODSs". The 1994 guidance can be found in the chronological listing.

transition to the use of non-class I and non-ozone-depleting refrigerants. General guidance and recommendations for the phaseout of all remaining chillers using class I refrigerants are presented in Section 2.1.3.

An equipment inventory should form the basis for any general refrigerant management plan, and decisions on whether equipment is to be retained, retrofitted, or replaced[5]. All chillers should be listed separately in the inventory. Each building should be inventoried separately. During the inventory, cooling requirements for the building should be reviewed, and an assessment made of whether existing equipment meets or exceeds that need. Information on future uses of the building, projected need for the building, and the activities that it houses should also be assessed, along with any energy-efficiency improvements that might reduce the need for cooling. This information will be useful in identifying the type and capacity of replacement equipment, if required, and the necessary useful life of the application. For example, extensive relighting may change the building cooling requirements. Individual building inventories can eventually be consolidated to develop long-range plans for the DOE facility as a whole.

2.1.2 Replacement or Retrofit Decision Making

Once the refrigeration and air conditioning equipment inventory has been compiled as discussed in Section 2.1.1, we recommend that the equipment be classified according to its remaining useful life and, within this grouping, according to its potential for leakage. The 1994 guidance established three categories of remaining useful life as decision points for equipment retention or retrofit or replacement: greater than 10 years, 5 to 10 years, and less than 5 years of remaining useful life. The engineers in charge of equipment maintenance and service will generally be responsible for determining the equipment's remaining useful life; however, it is suggested that the useful life of the equipment not be excessively prolonged. Facilities may tend to retain equipment until the cost of maintenance exceeds or approaches the cost of replacement. Also, facilities will need to replace equipment before it fails completely. Chillers are large and expensive pieces of equipment, and replacing one takes time and planning to finanace and install (so as to avoid having to hastily purchase and install equipment to replace a failed chiller in the middle of the summer, for instance). In addition, the fact that chlorofluorocarbons (CFCs) will become increasingly difficult and expensive to obtain should be factored into determinations of the equipment's remaining useful life. Figure 2.1 provides a recommended framework for decision making based on equipment remaining useful life.

Equipment Replacement

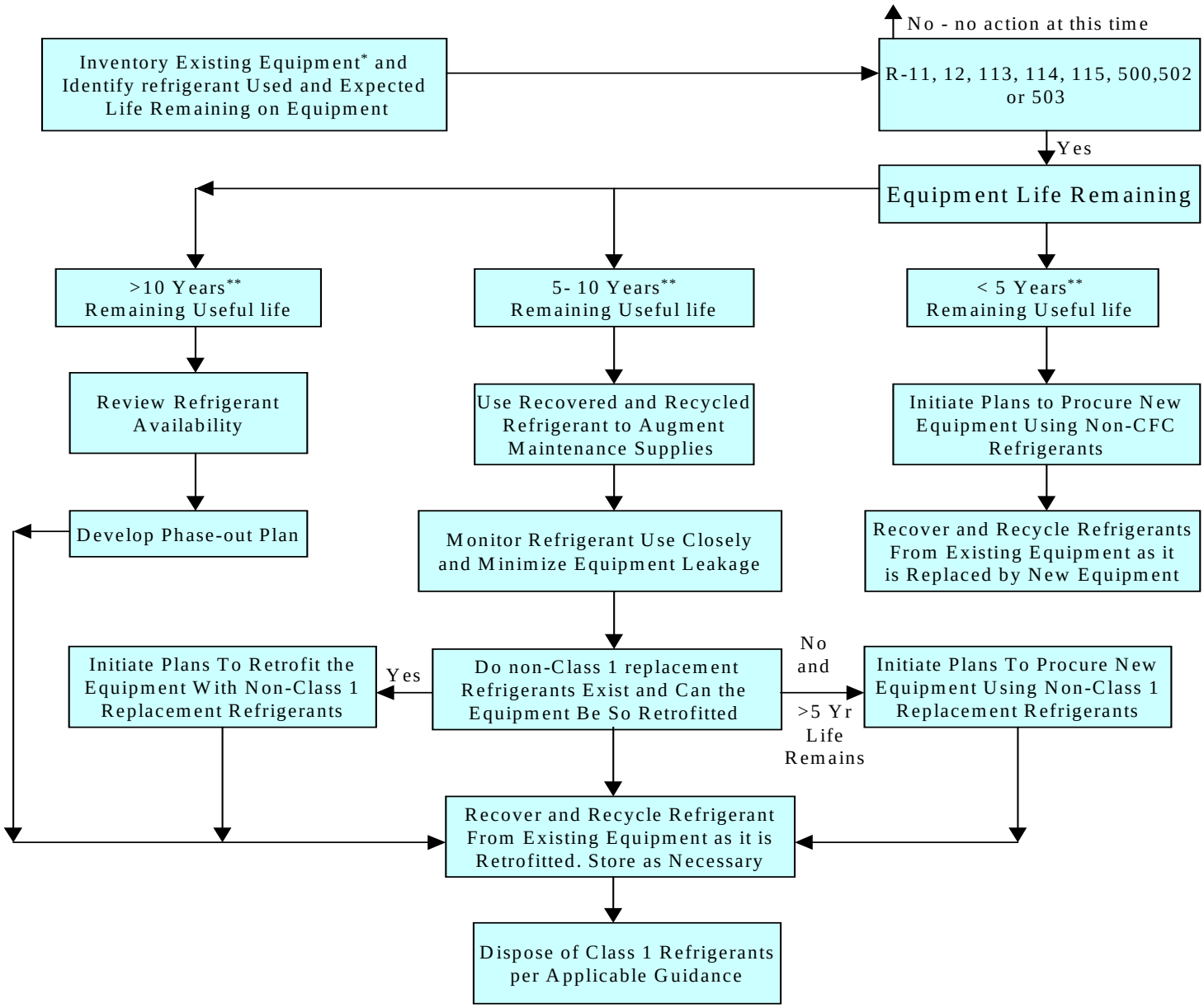
As our suggested scheme in Figure 2.1 shows, equipment with a remaining useful life of less than 5 years has generally the highest priority for replacement. In general, this equipment is less cost-effective to retrofit than newer equipment and tends to be more prone to leakage. Managers that are responsible for chillers should plan to obtain new equipment that uses hydrochlorofluorocarbons (HCFCs) or non-ozone-depleting substances if: (1) the remaining useful life of the equipment is less than 5 years, or; (2) the service history and leak assessment indicate that replacement would be cost-effective, or; (3) they

[5]The 1994 EH guidance recommended that all major chillers that use class I and class II refrigerants be inventoried, as well as smaller equipment (which could be grouped together by building). The 1994 guidance provided considerable detail on the development of an equipment inventory, which is an important element for refrigerant management planning.

Suggested Approach for Refrigerant Management

Figure 2.1

Adapted from *Recommended Approaches To Management of Refrigerants at Department Of Energy Facilities*, DOE, Office of Environmental Guidance, August 1994



* The equipment inventory and use of EH's Recommended Approaches in Managing Refrigerant should lead to a plan that determines what actions (maintenance, retrofit, or replacement) should be taken for each existing piece of equipment. This inventory should be done by building then by facility.

**It is recognized that age of equipment is not the only criterion for deciding a particular strategy. Energy efficiency, cost, size, location, available sources of refrigerant, and other factors will all impact the classification of equipment. A methodology to assesas these factors and plan for reasonable uniform decision on when a particular piece of equipment is a candidate for replacement, reclamination to "bridge the gap," or retrofitting to use non-CFCs will need to be developed

believe that adequate supplies of refrigerant will not be available to service the equipment in the future. The equipment manufacturer or company that holds the warranty should be able to provide information and recommendations on new equipment. Table 2.1 lists items to be considered when deciding to replace old equipment.

Table 2.1 Equipment Replacement Considerations

Life-cycle Costing:

Remaining useful life/equipment size
Service history
Leak assessment/cost of leak repair
Facility refrigerant phaseout schedule
Current refrigerant cost and cost trends
Availability of existing refrigerant supplies
Operations and maintenance costs
Equipment annual hours of operation
Energy costs of current equipment vs. replacement
Cost of new equipment[6]
Construction cost - for new equipment
Utility company rebate (if applicable)
Availability of non-CFC refrigerants and equipment
Accessibility of chillers for removal and replacement
Ability of chillers to work in combination with new control systems, variable speed equipment, etc.

Other Issues:

Chiller performance/desired performance
Projected building air-conditioning growth
Safety requirements
Potential to downsize equipment
Potential to run more efficiently with smaller chillers or staged chillers of different sizes
Potential to solve building comfort and/or maintenance problems

We recognize that managers responsible for chillers with a useful life of less than 5 years may not have a choice other than to replace the chiller with another similar non-CFC chiller, because of the relatively short-time horizon to failure (as defined by an inability to produce cooling in a reliable, safe manner), and the relatively long-time horizon needed to study the situation and install the replacement option

[6]The revised Uniform Mechanical Code and ASHRAE Standard 15 impose new refrigeration mechanical room requirements that can increase both capital and operational costs and need to be considered in economic analyses.

(typically 3 years). A retrofit or a continuation of further maintenance probably are not viable options for this situation. However, a life cycle cost analysis should be performed primarily to support a decision whether to seek appropriated funding or ESPCs for the replacement. It may be desirable for the managers to supply the analysis with their budget submissions for the chillers.

The replacement of large chillers is generally considered a "cost of doing business" because capital stock does wear out even with good maintenance. The planning for replacement of physical plant assets is an integral part of good management. Also, chiller replacement planning provides an opportunity to improve building systems and reduce cooling loads, which will allow downsizing of the new chillers.

Equipment Retrofit

As Figure 2.1 shows, equipment in the 5-10 year remaining useful life category may be cost-effectively retrofitted or maintained, unlike equipment that is nearing the end of its useful life. There are currently no drop-in replacements for CFCs in existing refrigeration and air conditioning equipment. Retrofitting, therefore, usually requires replacement of other equipment components (such as seals, impellers or motors) or can involve replacement of the entire drive line. Many manufacturers recommend that conversions be planned at the same time as the recommended major overhauls. This prevents costly, unscheduled shutdown of systems. Table 2.2 lists items that should be considered when planning equipment retrofits.

Table 2.2 Equipment Retrofit Considerations

Life cycle costing:

Remaining useful life/equipment size
Service history
Leak assessment
Facility refrigerant phaseout schedule
Current refrigerant cost and cost trends
Availability of refrigerant supplies
Operations and maintenance costs
Equipment annual hours of operation
Energy costs of current equipment versus retrofit
Retrofit cost

Other Issues:

Chiller performance/desired performance
Projected building air conditioning growth
Safety requirements
Potential to downsize equipment
Overall systems performance
Overall building performance and comfort

If the equipment is in the newer end of the 5-10 year remaining useful life range and is in generally good condition, replacing it prior to its end of useful life may not be necessary. Equipment in this category is a good candidate for incorporation in plans for an extensive integrated retrofit. There would be time available to plan and execute building load reductions and system improvements. These may allow a facility to downsize replacement chillers, thus saving capital costs. If the equipment is older, or is in generally poor condition, it should be added to the list of equipment to be retrofitted or replaced in the near future.

Retrofit vs. Replacement

For chillers greater than 150 tons capacity that are the subject of the Secretary's memorandum, the energy efficiency of the existing equipment relative to the efficiency of retrofitted or new equipment should be carefully considered. For highly inefficient, existing systems, replacing the equipment may be more cost-effective than retrofitting if the costs of replacement can be realized in energy (and energy-related operations and maintenance) savings. The decision on whether or not to retrofit would be facilitated by a comparison of the equipment's current performance with desired performance. If the present system is barely meeting current needs, then performance after the retrofit may be less than adequate due to a typical 10% derating when retrofitting a chiller to use a different refrigerant. Experience has proven that most chillers are oversized, and that the building loads can be reduced through low-cost energy conservation measures. Load reductions (e.g., lighting, day lighting, occupancy sensors, cool roofs, window films) and system improvements (e.g., new motors, variable speed equipment and new control systems) can help make up for lost capacity. We recommend that sites take actions to evaluate chiller performance and to reduce the cooling load before making a decision to retrofit or replace a chiller.

In any decision, the manager responsible for the project should contact the original manufacturer for advice. The manufacturer should be able to analyze the current system and project the expected system performance after conversion to another refrigerant. The manager responsible for the project should also investigate any effects that a change of refrigerant may have on equipment warranties.

Each DOE facility will need to determine the best overall approach that meets its particular circumstances to the question of whether to choose either an equipment retrofit to a non-class I refrigerant or an outright replacement. An analysis of the situation that takes into account the costs of a conversion with no increased efficiency (or an actual decrease in efficiency), the costs of maintaining older equipment, and the shorter life expectancy of the retrofit equipment against new equipment needs to be carefully performed. This analysis then needs to be put into an overall site perspective that considers and prioritizes energy efficiency and environmental projects.

2.1.3 General Guidance for the Phaseout of All Remaining Chillers Using Class I Refrigerants

In his December 10, 1998, memorandum, the Secretary has also requested that each DOE facility plan for the eventual phaseout of all chillers that use class I refrigerants. This particular Secretarial request partly addresses ozone-depleting substance phaseout requirements that the Department faces in Executive Order

(E.O.) 12843, and in the Environmental Protection Agency (EPA) regulations (at 40 *CFR* Part 82, Subpart D) that implement Section 613 ("Federal Procurement") of the Clean Air Act (CAA). The Executive Order and EPA Rule require Federal agencies to significantly reduce use, where practicable, of ozone-depleting substances, through cost-effective procurement practices and through the substitution of safe alternative substances, and to provide leadership in their phaseout. In October 1995, the Office of Environment, Safety and Health issued implementing guidance for the use and phaseout of class I and class II substances to enable DOE organizations to meet the broad and specific requirements of the Executive Order and the EPA Federal Procurement Rule.[7]

There are also cogent class I refrigerant supply-related reasons to plan for the elimination of all chillers using these refrigerants. The production of these refrigerants was ended in the U.S. as of January 1, 1996, so that their future availability (especially beyond 2001) is uncertain. Our limited evaluation of the future availability of class I refrigerants indicates that the nation's supply is expected to remain stable over the next two years. Currently R-11 and R-12, the most widely used class I refrigerants, are readily available at relatively reasonable prices. The supply of R-500 and R-502 is stable at the present time due to the rapid conversion of equipment using them. However, because of the specialized nature of equipment using R-114 (and to a limited extent R-500 and R-502), the availability of these refrigerants could potentially be scarce in the future.

During the assessment of alternative approaches for eliminating the 150-ton-capacity chillers built before 1984, it would be appropriate for managers that are responsible for chillers to initiate and carry out a review of the other remaining chillers that use class I refrigerants. The review should identify all chillers that will eventually need to be replaced, and thus it can serve as the basis for a comprehensive site plan for upgrading the chiller stock. In addition, a review of the chillers falling outside of the 150-ton phaseout criteria can identify potential candidates that could possibly be included in energy-efficiency upgrade projects at the present time. A review of chillers rated less than 150 ton capacity may also help to point out ways to combine various chiller systems. At some facilities it may be possible to combine systems and/or stage chillers to improve the overall facility efficiency over typical loads.

Class II Ozone-Depleting Substances

E.O. 12843 and the CAA "Federal Procurement" regulations require that Departmental elements seek and use safe alternative chemicals and technologies to replace ozone-depleting substances in new and existing DOE applications and processes, to the maximum extent practicable. However, substitution is not currently required for class II ozone-depleting substances identified as safe alternatives to class I substances in EPA's *"Significant New Alternatives Policy Program"*[8]. Class II ozone-depleting substances are those chemicals that will cause or contribute to harmful effects on the stratospheric ozone layer, but are not so deleterious to the ozone layer as class I substances. At this time the list of class II substances includes all HCFCs. Production and use of class I substances is being phased out more rapidly than class II substances because they affect the ozone layer more significantly.[9] The production

[7] This guidance is available from the EH-41 Web Site: http://www.eh.doe.gov/oepa/guidance/ozone/; at this site click on "OEPA Guidance/Correspondence on ODSs". The 1995 guidance can be found in the chronological listing on the "OEPA Guidance/Correspondence on ODSs" page.

[8] The regulations are found at 40 CFR Part 82, Subpart G.

[9] A listing of class I and class II controlled substances can be found in Appendices A and B, respectively, of 40 CFR Part 82, Subpart A, "Production and Consumption Controls".

phaseout schedule for class II substances is provided in Table 2.3.[10]

Table 2.3 Clean Air Act Production Phaseout Dates for Class II ODSs	
Class II ODS	**Production Phaseout Date**
HCFC-22 HCFC-142b	January 1, 2020 January 1, 2020
All other HCFCs	January 1, 2030

The E.O. and the Federal Procurement regulations explicitly allow the use of class II substances as interim substitutes for class I substances. Currently, HCFCs are the only commercially available alternatives for some CFC-refrigerant applications. HCFC equipment that is purchased today should have ample time to realize a return on investment before the class II production phaseout comes into effect. To begin the planning process for the eventual phaseout of class II refrigerants, refrigerant management planning activities should also account for chillers using class II refrigerants, and each facility's HCFC refrigerant inventory.

2.1.4 Disposition of Class I Refrigerants

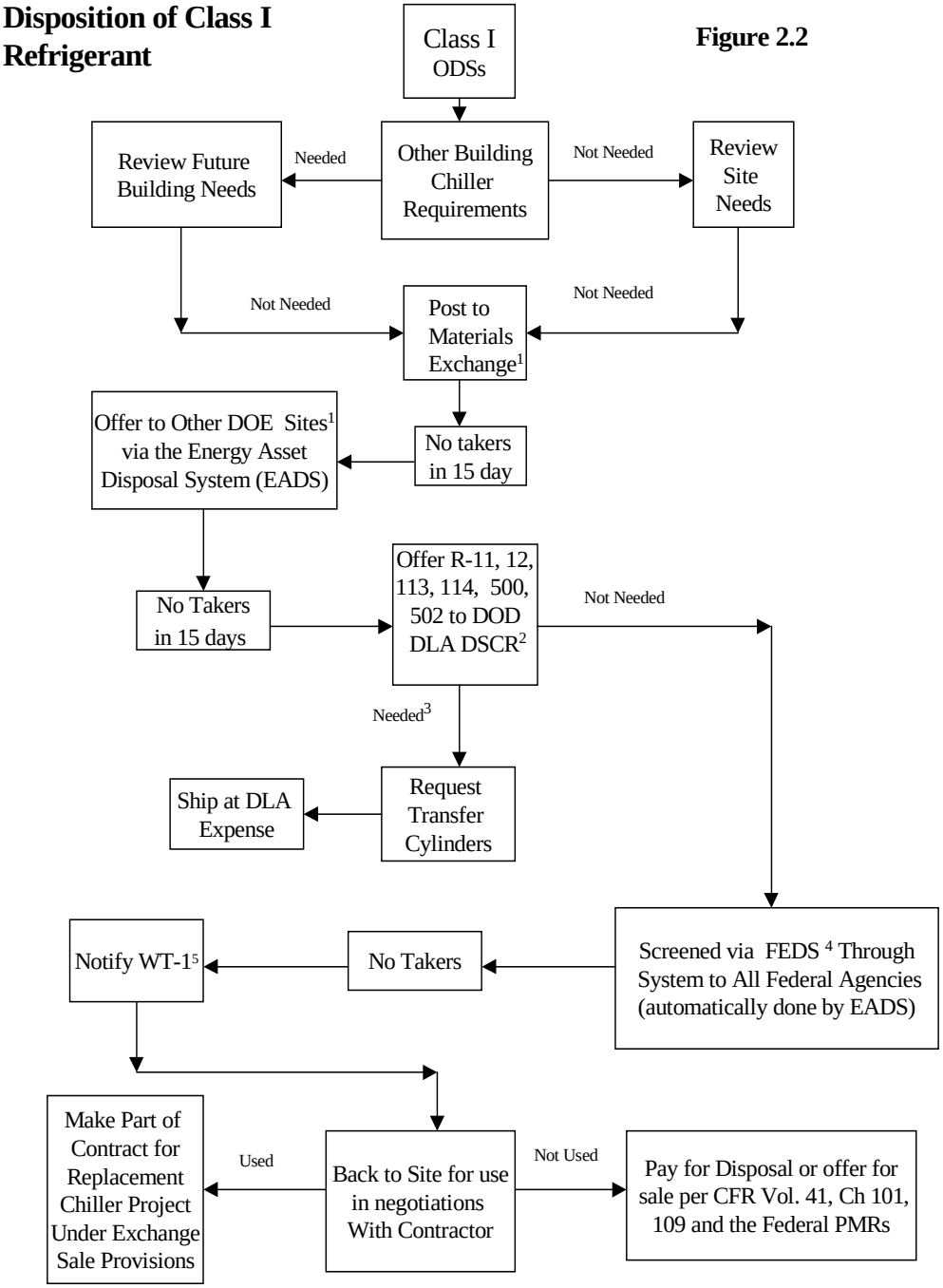
As more and more refrigeration and air conditioning equipment that uses class I refrigerant is replaced and retrofitted, the question of what to do with the removed CFCs assumes increasing importance. Figure 2 presents a decision tree for the disposition of all species of class I chemicals that are used as refrigerants. A refrigerant management plan that includes an equipment inventory would identify whether the removed refrigerant from retrofitted or replaced equipment should be stockpiled onsite to service other equipment still using CFCs. As Figure 2.2 shows, if it has been determined that there is no need for the removed refrigerant as a reserve for other onsite equipment, then the unneeded class I refrigerants should be made available to other DOE facilities through the DOE EPIC Materials Exchange System[11].

[10]From 40 CFR Part 82.4

[11]The DOE EPIC Materials Exchange web site located at http://wastenot.er.doe/DOEmatex/index.html can be used to post available or wanted materials. An identification number and password for access to the system can be obtained through the DOE's Pollution Prevention Information Clearinghouse located at http://epic.er.doe.gov/epic)

Disposition of Class I Refrigerant

Figure 2.2



Notes for Figure 2.2:

1. All excess refrigerant from 150+ ton capacity chillers must be reported on the Energy Asset Disposal System (EADS) system. Another system available to advertise available refrigerant is the DOE EPIC Materials Exchange System. EPIC is a password-protected site (URL wastenot.er.doe.gov/doematex). Contact Arnold Edelman (301) 903-5145 for additional information and access.
2. DoD Defense Logistics Agency Defense Supply Center - Richmond, Strategic Reserve POC Joe Schmierer, DLA OZONE DEPLETING SUBSTANCES PROJECT OFFICE Defense Supply Center Richmond ATT:DSCR-RP, Richmond, VA 23279-5100 (804) 279-4525, 5202, 5203, 6102; FAX 804/279-4970; Email:odsreserve@dscr.dla.mil
3. See Appendix B and contact DSCR to request transfer cylinders and the prepaid shipping instructions.
4. The General Services Administration Federal Excess Disposal System (FEDS).
5. If there are no requirements for the refrigerant, then the site is free to negotiate with the contractor but must notify WT-1 for review.

If other DOE facilities do not express interest in acquiring the unneeded refrigerant, then the refrigerant needs to be declared to be excess property to be managed in accordance with Federal and Departmental property management laws and regulations. We recommend that managers responsible for the excess refrigerant should confer with the DOE site's senior manager in charge of property to ensure that appropriate procedures are followed. To make other facilities aware of the availability of excess refrigerant, excess refrigerant data are required to be entered on the DOE-wide Energy Asset Disposal System (EADS) for internal utilization screening, as shown in Figure 2.2[12]. Facilities may at their option post excess refrigerant information on the EPIC Materials Exchange System.

Class I refrigerants declared excess by Program Managers need to be documented in the appropriate property inventory systems. The amount, type and location of all excess class I refrigerants should be compiled into a single property inventory-linked document for disposition tracking purposes maintained by Organizational Property Management Officers and designated excess. All excess class I refrigerants identified in Figure 2.2 not wanted by other DOE facilities should be transferred into the Department of Defense Ozone Depleting Substances Reserve operated by the Defense Logistics Agency (DLA), and the transfer certified by Field Managers. The Department of Defense has a need for nearly all of the different class I chemicals that are used at DOE facilities and that have been declared excess. Procedures for transferring excess ozone-depleting substances to DLA are provided as Appendix B.

For excess refrigerant that DLA does not want, and for other class I refrigerant not shown in Figure 2, existing regulations require that the General Services Administration (GSA) be notified so that they can advertise its availability throughout the Federal sector. The EADS process handles the notification of GSA. If no Federal agencies express interest in making use of the class I refrigerant, then the owning DOE facility may sell the refrigerant, or may negotiate with its chiller replacement manufacturer for its removal, or may arrange for its disposal and destruction. Managers responsible for excess class I refrigerants also must notify the Director, Office of Worker and Community Transition (WT-1) concerning the availability of excess class I refrigerants not claimed by other Federal agencies. The notification should include information on the amount, type and location of the class I refrigerant. As the DOE representative to the interdepartmental Market Impact Committee, WT-1 will notify the Committee of the availability of the refrigerant, as required under Federal statute to determine the potential domestic and international economic impacts of the government's disposition of these materials.

As an alternative disposition option, the Department could seek a waiver to the Federal Property Management Regulations (FPMR) to use the exchange/sale authority for the exchange of unneeded class I refrigerants in conjunction with chiller replacements/retrofits. For this situation, the refrigerants would not be excess, since they were being replaced. This option would probably better benefit the Department by lowering the cost of the equipment replacement or retrofit. It would also eliminate the necessity to pay for disposal of the replaced refrigerants. The Office of Contract and Resource Management (MA-53) would be willing to work with a single program office that would take the lead in coordinating the information needed to request a waiver from GSA.

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[12]The requirements on DOE facilities for reporting excess personal property specify that all excess with an original acquisition cost of $5,000 be entered into the DOE Energy Asset Disposal System for utilization screening within the Department. The exception to this requirement is personal property classified as Federal Supply Classification Codes (FSC) groups 66 (Instruments and Laboratory Equipment), 70 (General Purpose Information Processing Equipment [Including Firmware], Software, Supplies and Support Equipment), and 99 (Miscellaneous). These FSC groups will be reported when the unit cost, measured in acquisition dollars, is $1,000 or more.

Under the *Montreal Protocol on Substances that Deplete the Ozone Layer*, excess ozone-depleting substances, including CFCs and HCFCs, must be destroyed using acceptable technology once they are no longer required for servicing existing equipment. Destruction technologies for class I and II ozone-depleting substances are required to achieve a 99.99% efficiency rate. For the foreseeable future, most class I refrigerants will likely be needed for servicing existing equipment, so that disposal and destruction will not pose immediate concerns for most users. However, refrigerants will need to be properly destroyed if they become so chemically- or radioactively-contaminated, or complex that they can no longer be effectively recycled and used. EPA has not issued regulations for the disposal or destruction of CFCs, beyond requiring that CFCs be removed from equipment before equipment disposal. If air conditioning or refrigeration equipment, or small appliances containing ozone-depleting substances, are to be disposed of, managers responsible for the equipment need to ensure that any ozone-depleting refrigerant remaining in the system is removed prior to disposal, as required by the EPA *"Recycling and Emissions Reduction"* regulations of 40 *CFR* Part 82, Subpart F.

Where disposal or destruction of CFCs is required, managers responsible for the refrigerant should ensure that it is undertaken in a manner that would achieve compliance with the Clean Air Act and the *Montreal Protocol*. A number of possible destruction techniques for CFCs have been identified, including thermal incineration, catalytic incineration, pyrolysis, chemical and metal scrubbing/destruction, wet air oxidation, and supercritical water oxidation, as well as some biological and electrical processes[13]. Only thermal incineration is currently available and is a proven technique for CFC destruction. Deliberate venting of excess refrigerants as a disposal method is prohibited by Section 608(c) of the Clean Air Act and EPA's Subpart F regulations and is totally unacceptable from the environmental standpoint. DOE has significant experience in managing waste and is well positioned to manage the destruction and disposal of its unwanted refrigerants.

2.2 Project Planning and Decision Making

DOE sites face many management challenges dealing with environmental and energy efficiency requirements and programs. In managing the site, staff are asked to accomplish a multitude of jobs ranging in difficulty from simple to very complex and hazardous. While accomplishing jobs and meeting these challenges, they may need to attain energy efficiency goals, reduce energy costs, keep older systems operational while simultaneously reducing maintenance and repair costs, and comply with regulatory requirements such as phasing out the use of class I refrigerants and reducing Toxic Reporting Inventory reportable emissions. While these challenges are difficult enough, they are asked to meet them with limited and increasingly scarcer funding.

As the appropriated internal DOE funding becomes more difficult to obtain, the energy and environmental managers will need to explore developing solid projects that are financially convincing enough that they can be supported through private sector financing. This external alternative financing option exists for energy-efficiency projects and should be aggressively pursued. Many chiller projects can be made more attractive for funding when combined with other energy-efficiency measures. This "alternative financing" includes Energy Savings Performance Contracts (ESPCs).

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[13] from *Technical Progress on Protecting the Ozone Layer*, Report of the Technology Review Panel, United Nations Environment Programme (UNEP), 1989, Nairobi, Kenya.

Regardless of the funding option sought, a solid planning foundation is necessary to successfully decide on an approach, compete for the funds, plan the project, implement the project, select a contractor, monitor the results, and ensure the success and persistence of the results.

2.2.1 Planning an Approach for Chiller Replacement

One of the prime objectives of the December 1998 Secretarial memorandum was to accelerate the phaseout of class I refrigerants, particularly in chillers built prior to 1984 and having a capacity of 150 tons or greater[14]. This makes the identification of the specific chillers meeting the criteria straightforward. However, once these specific chillers are identified, the approach to accomplish the task and meet the objective of eliminating the refrigerant must be determined and clearly defined.

The current economic conditions that prevail with energy costs at DOE sites sometimes make it difficult for a single chiller project to meet the current economic guidelines for payback periods within 10 years. This means that it may be difficult to consider all chiller projects as solely return-on-investment projects, and this may limit the available funding sources for these projects. In order to assist in meeting the project payback criteria, we recommend that chiller projects be combined or "bundled" with other energy-efficiency projects to obtain the funding through the various alternatives available. This does entail developing large projects and looking at all energy-efficient alternatives (e.g., efficient lighting, building automation and energy management systems, etc.). Projects that demonstrate good returns on investment will have a much easier time finding funding sources.

2.2.2 What Are the Available "Funding" Options

While obtaining funding for a needed project is not always simple, there are some different approaches to developing projects and locating available funds to support them. In some cases sites have been able to develop funding through local operation and maintenance (O&M) sources, project development sources, grants, and other site-unique situations sufficient to complete projects. Others have programmed well ahead and been able to support, justify and obtain appropriated funding, while still others have been working on completing projects using a private sector financing approach through the ESPC mechanism. This guidance document recognizes that many funding options may be available, and that all appropriate funding options should be considered for meeting the Secretary's goal.

<u>Local Operating Funding</u>

At each site there exists various categories of funding that may be available for use on different projects. These may be called "General Plant Project" funding, "O&M" funding, plant improvement funds, utility funding, or other names. The project engineers in conjunction with the site "energy managers" and "environmental managers" need to work closely with selected financial personnel to determine the sources of funding that may be available for the projects under the mandates of the Secretary's memorandum. Additionally, other project criteria such as code compliance, meeting regulatory requirements from external inspections, changing mission requirements, health and safety, and existing contractual agreements with tenant organizations (private parties leasing real property from DOE), may

[14] Preliminary analysis indicated that this subset of the chiller population would have a significant impact on the class I refrigerant inventory and that the economics would allow a significant part of the replacements to be accomplished with a simple payback of 10 years or less.

provide additional support for developing local funding options. Projects that combine chiller work with projects that improve building comfort, improve indoor air quality or reduce maintenance requirements may also help to tap into non-traditional funding sources.

Appropriated Funding [15]

The Chief Financial Officer's FY 2001 Field Budget Call includes a section on budgeting for the phaseout of DOE's air-conditioning and refrigeration chillers in accordance with the Secretarial goal. At some locations it is necessary to replace several chillers every year to maintain the chiller stock in efficient working condition and within its "useful life", and a programming of replacement projects as line items in the budget is a valid requirement. Normally any requirement for appropriated funding is a long process (2 years or more) and needs to be submitted through the normal site programming and budgeting process. Requirements generally need to be well planned, justified and submitted no later than two years before the replacement/retrofit/upgrade is actually needed to have a reasonable expectation of getting funded on time. It will need a strong justification showing the importance of the requirement (to compete with other priorities), and the Secretarial goal for phaseout of DOE chillers should provide this justification.

Using appropriated funding does have some advantages for the site. Direct funding allows the site to gain the entire benefit of any savings realized from the installation of new equipment or upgrades. These include savings from reduced energy use, reduced O&M costs, better process efficiency, quality of life improvements, and environmental enhancements. In relation to the various alternative financing vehicles, appropriated funding provides the agency more flexibility to respond to unexpected changes in both the short term (in-house design and construction alternatives) and the longer term of mission changes and deregulation.

Some of the drawbacks for using appropriated funding include the total responsibility for project execution (could also be considered a strength by some), high up-front capital costs, and loss of energy savings during the budgeting/appropriation period.

The actuality is that for projects with a high probability of successful energy savings (low- risk, straightforward projects) and small-to-medium-sized projects, or extremely urgent projects, appropriated funding may be the best alternative, or the only one available.

Energy Savings Performance Contracting [16]

Energy Savings Performance Contracts (ESPCs) are a specific vehicle mentioned in the Secretarial memorandum, and the President has directed Federal agencies to expand their use. The basic concept of an ESPC is to use a contracting vehicle that allows an Energy Service Company (ESCO) to provide funding to identify and implement energy-efficiency improvements which then is repaid by the facility from the energy savings resulting from their investment over an agreed upon time period. After the time

[15] Portions of this discussion were taken from the Pacific Northwest National Laboratory (PNNL) Report SA-30924, Financing Energy Projects at Federal Facilities

[16] Portions of this discussion were taken from PNNL Report SA-30924, Financing Energy Projects at Federal Facilities, 1999.

period the Government facility then enjoys the full savings. Ideally, projects with 10-years-or-less payback periods can be accomplished under ESPCs (which have a 25-year contract period). In some cases projects with 13- to 15-year payback periods could be economically feasible and accomplished under ESPCs.

Congress has given Federal agencies the authority to develop contracts with terms up to 25 years for projects financed through ESPCs using private capital. The ESCO has the major portion of responsibility and guarantees a minimum performance level that must be verified annually and also may be required to operate and maintain the installed equipment. The ESCO must guarantee the energy savings in the delivery order awarded and does not receive any payment for services unless the savings are realized.[17]

The risk that the ESCO assumes is negotiable. The amount of energy savings guaranteed may range from the ESCO assuming all of the risk to sharing some of it with the government and adjusting the flow of payments for the project. This type of mechanism becomes particularly attractive when the government cannot fund a project, and the ESCO can offer unique expertise and technology.

Some of the chiller replacement projects will easily meet ESPC financing requirements because of a combination of expensive power costs, long operating hours, and overall low machine energy efficiency (greater than .8kW/ton). In other cases, such as a project of simply replacing or retrofitting the affected chiller, the economics may not justify an alternative financing approach due to extended payback periods on the investments.

All projects whether funded through appropriations or through ESPC can benefit from an integrated approach. The approach is termed an “Integrated Chiller Retrofit”, which means to change the chiller and “integrate” or include additional project work that adds to the energy savings potential of the overall project. The approach is especially suited for ESPC because it can create a project attractive to the ESCOs by combining a chiller project having a 10-to-15-year payback period with other energy-efficient upgrades that have shorter payback periods. This usually means including a wide range of building systems in the project. Upgrades can include modifying air handling systems, cooling towers, water handling and distribution systems, controls, lighting and the building envelope. In this way the overall energy efficiency of the site is improved, and the very high return on investment projects, such as motors and lighting improvements, can support some of the longer-return projects. This is the purpose of “bundling” the various energy efficient efforts together into one project.

The “Cool Sense Integrated Chiller Retrofit" web site is a good place to find information and examples of integrated retrofits and their benefits. An in-depth discussion of these various project development steps and options can be found in the *Indefinite Delivery Indefinite Quantity Contracting Users Guide*, located at http://eetd.lbl.gov/coolsense/idiqc.html. An analysis tool for looking at the “bundling” option or also referred to as an “integrated chiller retrofit” can be found at http://velo.lbl.gov on the “FEMP Super ESPC”, Analysis Tools”. These tools are in the form of downloadable workbooks and include financial factors unique to the performance contracting approach. Other guidance is available in the recent DOE Office of Federal Energy Management Programs (FEMP)-sponsored report from PNNL titled “Financing Energy Projects at Federal Facilities”, Report Number PNNL-SA-30924. The report presents a simple matrix to be filled in by the site comparing local funding and ESPC funding that assists managers in reviewing the options.

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[17] April 1996 PL 99-272 codified as and 42 USC 8287

To further assist the sites in using the ESPC mechanism, FEMP has developed what is termed "Super-ESPCs" based on a provision of the Federal Acquisition Regulation that deals with "Indefinite Delivery Indefinite Quantity" contracts. These Super-ESPCs are developed on a broad regional basis and allow Federal sites to negotiate site-specific delivery orders (under the regional ESPC) with an ESCO that has been pre-qualified. The ESCOs have previously competed and been awarded a contract by DOE to be eligible to perform work at sites. The effect of this method is to speed up the contracting process and allow sites to develop a Delivery Order addressing the site-specific needs for their ESPC projects under the Super ESPC contract and save time, energy and money.

To be a viable ESPC project, the potential savings should be at least $25,000 per year and preferably greater. The Super ESPC ESCOs look for sites that have an annual energy expenditure of at least $500,000, which equates roughly to around 330,000 square feet. More information on ESPCs can be obtained through the FEMP web page at URL: h t t p : / / www.eren.doe.gov/femp.

A network of DOE Regional Office and national laboratory personnel, the FEMP Service Network (FSN), provides procurement and technical support services for implementing Super ESPC Delivery Orders. The FSN provides reimbursable support for the use of Super ESPCs through intragency agreements with DOE sites. Access to the FSN is provided through the DOE Regional Offices (ROs). The Regional Office contacts for FSN Super ESPC Delivery Order support are:

Atlanta RO	(AL,AR,FL,GA,KY,MS,NC,SC,TN,PR,VI)
	Doug Culbreth, 919-782-5238 or Carson.Culbreth@hq.doe.gov
Boston RO	(CT,ME,MA,NH,NT,RI,VT)
	Paul King, 617-565-9712 or Paul.King@hq.doe.gov
Chicago RO	(IA,IL,IN,MI,MN,MO,OH,WI)
	Sharon Gill, 312-886-8573 or Sharon.Gil@hq.doe.gov
Denver RO	(CO,KS,LA,MT,NE,NM,ND,OK,SD,TX,UT,WY)
	Randy Jones, 303-275-4814 or Randy.Jones@nrel.gov
Philadelphia RO	(DE,DC,MD,NJ,PA,VA,WV)
	Bill Klebous, 212-264-0691 or William.Klebous@hq.doe.gov
Seattle RO	(AK,AZ,CA,HI,ID,NV,OR,WA,AS,GM,PW,CNMI)
	Cheri Sayer, 206-553-7838 or Cheri.Sayer@hq.doe.gov

The following URL has more information about the FSN:
www.eren.doe.gov/femp/financing/fempservicenet.html

Using Basic Ordering Agreements (BOAs)

Within the Federal sector, efforts have been underway to streamline the contracting process to ensure getting the equipment needed, at the best prices, and in a timely manner, while minimizing the contracting process burden. One of the first mechanisms was a cost-saving procurement vehicle called a Basic Ordering Agreement (BOA) developed by DOE's Office of Defense Programs, and the GSA, Buildings Division in 1996. It was designed to streamline procurement for acquiring major industrial equipment through appropriated funding.

The BOA was linked to an equipment specification, developed by DOE, for 100 to 2000 ton commercially available centrifugal and rotary screw water-chilling packages. This specification would be used as the technical documentation for procuring that type of equipment for use at Federal sites. The

BOA was developed in a constructive partnership with industry and the five major domestic vendors of that type of equipment.

The specification, that includes efficiency standards that are consistent with the Government's energy-efficiency policy, stipulates how to apply the Federal life cycle cost (LCC) evaluation methods and required inputs. The LCC methodology was developed to save the government more money over the life of the equipment than simply purchasing the chiller with the lowest initial cost. The specification was written broadly to allow the agencies to meet their site-specific needs. The BOA was to facilitate the standardized ordering and contracting for replacing chillers at DOE sites and was available to any site that found the mechanism useful. The limitation on this mechanism was that it only related to the chiller and could not be used for ancillary equipment such as pumps, motors, plumbing, cooling towers, *etc.* More information on this contracting aid can be obtained by contacting Mr. Roger Snyder at (301) 903-4047 or E- Mail roger.snyder@dp.doe.gov. There have been contracts bid and let through the initial BOA process, and as a result (of those projects) there were "lessons learned" from those experiences. It was decided that an additional, broader, mechanism for using appropriated funding should be developed. The new BOA vehicle is called *"Indefinite Delivery Indefinite Quantity Contract for 100 to 2000 Ton Commercial Centrifugal and Rotary Screw Water-Chilling Packages Including Ancillary Parts, Equipment, and Services" (IDIQC).* The new vehicle is much broader in scope than the original BOA and in some ways is more of a standard contracting approach that contracting office personnel are familiar with. This facilitates the process by requiring less effort to "educate" the contracting entity on the intricacies of the project financing approaches and procedures.

2.2.3 Determining the Life Cycle Cost of the Chiller Project

The calculation of energy and related O&M savings can range from the simple, using only a few variables (*e.g.*, cost per kWh, operating hours and efficiency kW/ton) to the complex using large databases of hourly monitoring data collected for many months or years. The level of analysis required is a decision that needs to be made at the local level to support the projects being developed and proposed. There is a multitude of guidance available on economic analysis. The analysis for energy projects is covered under the National Institute of Standards and Technology Handbook 135, "Life Cycle Cost Manual for the Federal Energy Management Program."

There is also a substantial amount of software available to support energy engineers in their efforts to calculate the life cycle cost for energy projects. However, FEMP recommends that all economic analysis be performed with the computer code "BLCC" provided by the National Institute of Standards and Technology, that follows the requirements of their Handbook 135. In addition, Defense Programs makes available a program called "CLCC" which performs chiller economic evaluations and also follows Handbook 135. "BLCC" is available by calling the FEMP Help Desk at 800-DOE-EREC, and the "CLCC" can be obtained by contacting Mr. Roger Snyder at (301) 903-4047 or E- Mail roger.snyder@dp.doe.gov.

A great deal of time and energy can be expended in developing complex simulations to determine energy savings. A very good discussion of the use and misuse of these simulation tools can be found at the CoolSense website developed for FEMP: http://eetd.lbl.gov/coolsense/. This site provides extensive information on the practical application of simulation to calculate energy savings.

2.2.4 Making Decisions Between Alternatives

The decision process for the alternatives is based on many variables. The source of funding is one consideration. The projects need to be developed, and innovative approaches should be taken within the guidelines of the regulations to meet specific site goals. As has been presented in previous sections, there are certain minimum thresholds for the viable ESPCs, the BOA for chillers only, the new BOA covering chillers and ancillary equipment, and ESPCs comprised of integrated chiller retrofits. Other considerations, including the need for special expertise and innovative technology only available from qualified ESCOs, may drive the decision on how to contract. The availability of local funding and programmed appropriated funding must be considered when the required projects are small and a high level of site control is needed or rapid project completion is required.

In putting together projects, it is conceivable that several sites could develop projects that require essentially the same type of capabilities . In this case the sites could coordinate and develop requirements for a larger volume contract under the current BOAs or under ESPCs where a manufacturer could supply several sites with similar chillers at lower cost than they could dealing with the sites separately. In developing projects, especially under the Secretary's December 1998 memorandum, DOE sites should seek to coordinate their efforts and determine the best approach at procuring chillers for multiple sites. This can be accomplished by working closely through the DOE Field Office energy coordinator as discussed in the next section.

The options for both funding and technology must be considered along with available site management and engineering resources regardless of which approach is taken. Sites that have large engineering staffs with available time to manage the construction projects and oversee the contractors may choose a different approach than a smaller site with fewer staff available to oversee the projects. The site with line-item appropriated funding can be more traditional in their contracting approach, while sites with limited funding will need to fully explore the ESPC and Super-ESPC approaches.

However, it should also be noted that the Secretarial memorandum highly recommended the use of ESPCs, which will allow other energy-efficiency measures to be integrated with the replacement of the chillers, without additional appropriated funding being necessary. This alternative, which may allow the capacity of the chiller and its associated cost to also be reduced, should be evaluated as the primary alternative for the majority of the chillers that will have to be replaced.

2.3 Role of Energy and Environmental Coordinators

At each DOE site there are staff responsible for the energy-efficiency and environmental issues involving pollution prevention. These individuals can make a substantial difference in overall building quality and energy use. They can work together to provide information to the personnel putting together the project plans and programs for replacing class I ozone-depleting refrigerants. They should work as a team to go beyond the bare minimum into a project that saves energy, reduces utility bills, reduces pollution, improves building comfort, solves maintenance problems and enhances the building value.

The site energy coordinator has a plethora of documents, guides, web-sites, user-groups and professional contacts available. It is incumbent upon the energy coordinator and engineering and design staff to evaluate options and develop a package that can be defended to site management, be properly procured, and finally be implemented into a completed energy-saving project.

It is also vital to any project or for coordination between sites on volume purchase that the DOE Field Office energy coordinator and their respective management understands the importance of the project. Their support is critical, and keeping the DOE energy coordinators and their management informed of the various plans and programs that are on-going at the site is part of a successful energy-efficiency program.

2.3.1 Assistance from Headquarters Organizations

Two groups at DOE headquarters can supply assistance on the elements of this guidance. Mr. Ted Koss (EH-42) (202 586-7964) theodore.koss@eh.doe.gov is the point of contact for environmental and regulatory issues associated with the phaseout of ozone-depleting substances. On energy-efficiency issues, Mr. Victor Petrolati, (EE-90) (202 586-4549), victor.petrolati@ee.doe.gov can provide guidance on the use of ESPCs, and economic analyses for projects.

2.3.2 Contact Lists of DOE-Wide Energy Coordinators

List in Appendix C

2.3.3 Contact List of DOE-Wide Pollution Prevention Coordinators

List in Appendix D

2.4 Exemption Process

In certain situations, the replacement or conversion of a given chiller meeting the age and capacity criteria of the Secretary's goal may not be warranted, generally because the costs of the project would far outweigh the economic or environmental benefits. For instance, a chiller may serve as a backup system, or operate only a very limited number of hours in a year. As another example, a chiller may operate in a facility that is planned to be surplused before fiscal year 2008. As a third example, a chiller may have recently been refurbished, so that its energy efficiency is improved, and the overall costs associated with its operation are very low.

If a site manager determines that any of these situations exist such that replacement or conversion of a specific chiller to meet the Secretary's directive is not warranted, then he should request an exemption through the appropriate DOE Field Office to the Lead Program Secretarial Officer (LPSO) as part of the site plan for phaseout of DOE chillers in accordance with the Secretarial memorandum. The following information should be provided in the request for the exemption:

- A description of the situation that warrants the exemption;
- Refrigerant used and the quantity;
- Estimated cost for chiller replacement or retrofit;
- Estimated operating and maintenance costs for the existing chiller;
- A demonstration that the expenditure of funds and resources is not commensurate with the resultant reduction in operating and maintenance costs;
- A demonstration that the expenditure of funds and resources is not commensurate with the resultant reduction in class I ozone-depleting substance emissions (*i.e.*, a demonstration that large replacement/retrofit expenditures would produce only a small, annual class I emission reduction from leakage from the existing chiller); and

- Date when chiller will be replaced or converted[18].

A copy of the LPSO's exemption approval letter with the site manager's exemption request as an attachment should go to Mr. Ted Koss (EH-41) and to Mr. Victor Petrolati (EE-90).

Chillers required to be replaced or retrofitted because of excessive leakage (per 40 *CFR* Part 82, Subpart F, "Recycling and Emissions Reduction") are not subject to this exemption process.

[18]The date when a chiller will be replaced or converted is not required for facilities operating in a closure mode for which excess DOE real property will be leased or sold to a non-Federal entity, and for which the Department does not plan to replace or convert chillers prior to the transfer, in accordance with an existing contract.

APPENDIX A

The Secretary of Energy
Washington, DC 20585

December 10, 1998

MEMORANDUM FOR ALL DEPARTMENTAL ELEMENTS

FROM: BILL RICHARDSON

SUBJECT: Phaseout Goal for DOE's Air-conditioning and Refrigeration Chillers to Protect the Ozone Layer and to Reduce Energy Costs

To make progress in meeting Clean Air Act and Executive Order requirements to maximize use of substitutes for ozone-depleting substances, I am establishing a departmental goal for the phaseout of Class I ozone-depleting substances--the class of chemicals most destructive to the stratospheric ozone layer. These chemicals are used forrefrigeration and air conditioning in many DOE chillers.

DOE's goal is the retrofit or replacement by 2005 of all DOE chillers using Class I refrigerants that are greater than 150 tons of cooling capacity and were manufactured prior to 1984.An exception process will be established for individual chillers where retrofit or replacement is not cost effective.Meeting this goal would eliminate 50 percent of DOE's use of Class I refrigerants and reduce energy costs by $6 million per year over the projected 23-year-life of the chillers.

The President has recently directed all Cabinet agencies to expand the use of Energy Savings Performance Contracting using private sector investment to reduce Federal energy costs and cut greenhouse gas emissions.I am committed to making DOE a leader in energy efficiency and pollution prevention.

Approximately 50 percent of DOE chillers can be replaced using Energy Savings Performance Contracting.I highly recommend the use of these contracts, which will allow other energy efficiency measures to be integrated with the replacement of the chillers. If this is accomplished the Department will need over $20 million in appropriations for replacement of remaining chillers.I also would like our facilities to plan for the eventual phaseout of all chillers using Class I refrigerants.

I am asking Mr. Dan W. Reicher, Assistant Secretary for Energy Efficiency and Renewable Energy, and the Department's Environmental Executive to work with the Assistant Secretary for Environment, Safety and Health to provide guidance to Secretarial Officers to implement a program and schedule for my goal. The Environmental Executive will coordinate and report our progress towards achieving this goal, and through our Federal Energy Management Program, assist DOE sites with using Energy Savings Performance Contracting to acquire these new chillers.

APPENDIX B

Procedures for Transferring Excess Refrigerants and Other Ozone Depleting Substances (ODS) into the DoD ODS Reserve

1. Defense Logistics Agency (DLA), Defense Supply Center-Richmond, will accept excess Ozone Depleting Substances (ODS), listed below, from sources outside the Department of Defense (DoD) into the DoD Reserve. Those ODS turned in to the DoD Reserve are determined by the donating Agency to be excess to their own requirements. Unless noted differently the ODS should be in reclaimable conditioned and not "burned". DLA also plans to offer "reserve type" support to other Federal Departments and Agencies for their own requirements, but procedures for that process are not yet completed.

Halons	**CFCs**	
1202	R-11	R-114
1211	R-12	R-502
1301	R-113 (used as a refrigerant)	R-502

2. Procedures:

   a. Pre/notification is needed when turning in the above listed ODS to the DoD ODS Reserve. The Defense Logistics Agency (DLA) Point of Contact regarding Ozone Depleting Substances is:

   Joe Schmierer
   DLA OZONE DEPLETING SUBSTANCES PROJECT OFFICE
   Defense Supply Center Richmond ATTN: DSCR-RP
   Richmond Va 23297-5100
   Phone: 804/279-4525,5202,5203, 6102
   FAX: 804/279-4970
   Email: odsreserve@dscr.dla.mil

   b. All types of cylinders containing ODS will be accepted including hand held fire extinguishers, system cylinders, and storage cylinders. Government owned recovery cylinders for ODS can be requisitioned by following normal FEDSTRIP procedures.

   c. All ODS cylinders[19] sent to DLA must be tagged/labeled as follows:

      (1) Record the shipper's address
      (2) The shipping activity's name with point of contact (POC) and telephone number.
      (3) Type of ODS (i.e., Halon 1301 or CFC R-12).

[19] If "like" or similar ODS cylinders, spheres, canisters or fire extinguishers are shipped in a box, container or pallet, apply only one tag/label to each box, container or pallet, not to each item.

(4) The quantity of cylinders and pounds of ODS contained within the shipping container.

(5) Apply a warning/hazardous label to the cylinder in compliance with Department of Transportation (DOT) regulations.

d. Fire suppression system cylinders and canisters with pyrotechnic charges or initiators must be deactivated prior to shipment to DLA. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders otherwise, a dangerous safety situation could arise during the shipping, receiving, or storage process.

e. Cost of Transportation: Costs of transporting excess ODSs will be born by the Defense Supply Center, contact the ODS Office for funding instructions. If a site does not currently possess adequate transport containers, inform the Defense Supply Center and they will provide them free of charge.

f. Transportation Guidance:

(1) When shipping ODS, refer to the following regulations if needed:

- MIL-STD-129L, Military Standard Marking for Shipment and Storage.
- DLAR 4145.25, Storage and Handling of Compressed Gases and Liquids in Cylinders, and of Cylinders.
- Code of Federal Regulations (CFR) 49, 173, 301, Requirements for Shipment of Compressed Gas Cylinders.
- DoD Regulation, 4000.25-1-M.
- Occupational Safety and Health Administration (OSHA) CFR 29 1910.1200.

(2) Once the shipment is ready, ship it to the following address:

Defense Depot Richmond Virginia (DDRV)
SW0400
Cylinder Operations
8000 Jefferson Davis Highway
Richmond, VA 23297-5000

DDRV's Routing Identifier Code (RIC) is SRG for those activities requiring that code.

APPENDIX C

Energy Coordinators and Operational Sites

Coordinator	Ops/Fld	Telephone	Fax	Internet
Anna Wolfe	AL	(505) 845-4963	- 4210	awolf@doeal.gov
Dino Herrera	AL	(505) 845-4186	- 4210	dino@doeal.gov
Dan Shirley	ID	(208) 526-9905	- 1184	shirledb@id.doe.gov
Shawn Herrera	NV	(702) 295-1697	- 0625	herrera@nv.doe.gov
Bill White	RL	(509) 376-6214	- 7290	William_A_White@RL.gov
Tom Brand	OAK	(510) 637-1696	- 2005	tom.brand@oak.doe.gov
Donell Jenkins	SR	(803) 725-0373	- 0375	donell.jenkins@srs.gov
Fred Wysk	CH	(630) 252-8618	- 8649	frederick.wysk@ch.doe.gov
George Herron	OR	(423) 576-1815	- 3799	herrongw@oro.doe.gov
Joe Kamosky	FETC	(304) 285-4649	- 4726	jkanos@fetc.doe.gov
Jerry Stansberry	RFO	(303) 966-7731	- 3321	jerry.stansberry@rfets.gov
Larry Boston	SPRO	(504) 734-4345	- 4299	
Lt Bill Shoemaker	NPR-W	(307) 261-5161	- 5817	
Mike Shincovich	HQ	(202) 586-1557	- 2517	michael.shincovich@hq.doe.gov
Greg Collette	GFO	(303) 275-4734		
Bill Edmonds	OSTI	(425) 576-1086	- 3609	Bill.Edmonds@ccmail.osti.gov

Coordinator	Ops/Fld	Telephone	Fax	Internet
Tim Marcus	OHIO	(937) 865-3020	-4402	tim.marcus@ohio.doe.gov
Annie Haskins	DEMT	(202) 586-4536	- 3000	annie.haskins@ee.doe.gov
Will Lintner	DEMT	(202) 586-3120	- 3000	william.lintner@ee.doe.gov
Vic Petrolati	DEMT	(202) 586-4549	- 3000	victor.petrolati@ee.doe.gov
Will Prue	DEMT	(202) 586-4537	- 3000	wilfred.prue@ee.doe.gov

Field Office	Sites Served State
ALBUQUERQUE (AL)	SANDIA NATIONAL LABORATORIES (SNL) NM/CA LOS ALAMOS NATIONAL LABORATORY (LANL) NM INHALATION TOXICOLOGY RESEARCH INSTITUTE (ITRI) NM WASTE ISOLATION PILOT PLANT (WIPP) NM KANSAS CITY PLANT (KCP) MO PANTEX PLANT TX GRAND JUNCTION PROJECT OFFICE (GJPO) CO PINELLAS PLANT (PIN) FL
IDAHO (ID)	IDAHO NATIONAL ENGINEERING LAB (INEL) ID
RICHLAND (RL)	PACIFIC NORTHWEST NATIONAL LAB (PNNL) WA HANFORD WA
OAKLAND (OAK)	LAWRENCE BERKELEY NATIONAL LAB (LBNL) CA LAWRENCE LIVERMORE NATIONAL LAB (LLNL) CA STANFORD LINEAR ACCELERATOR CENTER (SLAC) CA ENERGY TECHNOLOGY ENGINEERING CNTR (ETEC) CA
SAVANNAH RIVER (SR)	SAVANNAH RIVER SITE (SRS) SC

Field Office	Sites Served State
CHICAGO (CH)	FERMI NATIONAL ACCELERATOR LAB (FERMILAB) IL ARGONNE NATIONAL LAB-EAST (ANL-E) IL BROOKHAVEN NATIONAL LAB (BNL) NY PRINCETON PLASMA PHYSICS LAB (PPPL) NJ AMES LAB, IOWA STATE UNIVERSITY IA RADIATION LAB, UNIVERSITY OF NOTRE DAME IN BATES LAB, MASS INSTITUTE OF TECHNOLOGY MA
OAK RIDGE (OR)	OAK RIDGE NATIONAL LABORATORY (ORNL) TN Y-12 PLANT (Y-12) TN K-25 PLANT (K-25) TN OAK RIDGE INSTITUTE FOR SCIENCE & EDUCATION (ORISE) TN JOHNSON CONTROLS WORLD SERVICES FACILITIES TN CONTINUOUS ELECTRON BEAM ACCELERATOR FACILITY VA
ROCKY FLATS (RF)	ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE (RFETS) CO
SPRO	STRATEGIC PETROLEUM RESERVES LA
NPR-C	NAVAL PETROLEUM RESERVES CA
NPR-W	NAVAL PETROLEUM RESERVES WY,CO,UT
GFO	NATIONAL REVEWABLE ENERGY LAB (NREL) CO

Field Office	Sites Served State
OSTI	OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION (OSTI) TN
OHIO FIELD OFFICE	MOUND SITE OH
PITTSBURGH NR	PITTSBURGH NAVAL REACTORS OFFICE PA
SCENECTADY NR	SCHENECTADY NAVAL REACTORS OFFICE NY

APPENDIX D

Waste Minimization Coordinators - EM Pollution Prevention Coordinator Contacts

Operations Office	Contact	Address/Phone	FedEx Address
Albuquerque	Mike Sweitzer	U.S. Department of Energy Operations Office, Albuquerque P.O. Box 5400 Albuquerque, NM 87185-5400 WK: 505-845-4347 FAX: 505-845-6286 msweitzer@doeal.gov	Pennsylvania and H Streets Kirtland Air Force Base Albuquerque, NM 87115
Chicago	Antanas Bindokas	U.S. Department of Energy Operations Office, Chicago 9800 South Cass Avenue Bldg. 201 Argonne, IL 60439 WK: 630-252-2692 FAX: 630-252-8649 antanas.bindokas@ch.doe.gov	
Idaho	Charles Ljungberg	U.S. Department of Energy Operations Office, Idaho 785 DOE Place Idaho Falls, ID 83402 WK: 208-526-0198 FAX: 208-526-1926 ljungbc@id.doe.gov	
Nevada	Carol Shelton	U.S. Department of Energy Operations Office, Nevada P.O. Box 98518 Las Vegas, NV 89193-8518 WK: 702-295-0286 FAX: 702-295-1153 shelton@nv.doe.gov	232 Energy Way Las Vegas, NV 89030
Ohio Field Office	Doug Maynor	U. S. Department of Energy Ohio Field Office P.O. Box 3020 Miamisburg, OH 45343-3020 WK: 937-865-3986 FAX: 937-865-4402 doug.maynor@ohio.doe.gov	1 Mound Ave. Miamisburg, OH 45342

Operations Office	Contact	Address/Phone	FedEx Address
Oak Ridge	Ana Gonzalez	U.S. Department of Energy Operations Office, Oak Ridge EW-923 P.O. Box 2001 Oak Ridge, TN 37830 WK: 423-241-4212 FAX: 423-576-6074 gonzalezal@oro.doe.gov	55 Jefferson Circle, Environmental Management Oak Ridge, TN 37830
Rocky Flats	Dave Maxwell	U.S. Department of Energy Rocky Flats Office Building 460 Rm #163-55 Golden, CO 80402 WK: 303-966-4017 FAX: 303-966-4728 dave.maxwell@rfets.gov	
Richland	Anna V. Beard	U.S. Department of Energy Richland Operations Office 2355 Stevens M0-277 200 East Richland, WA 99352 WK: 509-376-7472 FAX: 509-372-1926 anna_v_beard@rl.gov	
Oakland	Karin King	U.S. Department of Energy Oakland Office 1301 Clay Street Oakland, CA 94612-5208 WK: 510-637-1638 FAX: 510-637-1646 karin.knig@oak.doe.gov	

Operations Office	Contact	Address/Phone	FedEx Address
Savannah River	Stephen Macmull	U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, SC 29802 WK: 803-725-3817 FAX: 803-725-3616	
	Sherri Johnson-Robinson	U.S. Department of Energy Savannah River Operations Office P.O. Box A Aiken, SC 29802 WK: 803-725-5793 FAX: 803-725-3616	
WIPP	Cynthia Zvonar	Carlsbad Area Office P.O. Box 3090 Carlsbad, NM 88220 WK: 505-234-7495 FAX: 505-234-7008 zvonarc@wipp.carlsbad.nm.us	4021 National Park Highway Carlsbad, NM 88220
	Cindy Woodin	Carlsbad Area Office P.O. Box 3090 Carlsbad, NM 88220 woodinc@wipp.carlsbad.nm.us	4021 National Park Highway Carlsbad, NM 88220
Golden Field Office	Deborah Turner (Debi)	U.S. Department of Energy 1617 Cole Boulevard Golden, CO 80401 WK: 303-275-4746 FAX: 303-275-4788 deborah_turner@nrel.gov	